BOTANICAL MUSEUM LEAFLETS
HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, NOVEMBER 6, 1950 VOL. 14, NO. 6

NOTES ON PERUVIAN CINCHONAS—I

BY
W. H. HODGE[1]

THE numerous collections of species of the genus *Cinchona* made throughout the Andes during the recent war by botanists of the Foreign Economic Administration (formerly the Office of Economic Warfare) have made it possible to reexamine critically the nomenclature and taxonomy of this admittedly difficult group. During the past century, dozens of species were described in the genus, but Standley (in Field Mus. Bot. 6 (1936) 24–33) claims that many of these "pertain to forms of scarcely or not at all more significance botanically than horticultural varieties of common garden vegetables." Therefore, in the most recent treatment of the genus for Peru, Standley (*ibid.*) reduced the number of Peruvian species to a mere handful, admitting, at the same time, that additional material might make it possible to amplify his treatment.

As cinchona botanist in Peru during the period 1943–1945, the writer had the unusual opportunity of collecting and seeing in their native haunts practically all the important forms of *Cinchona* occurring in that country. As a result of this fieldwork and subsequent herbarium

[1] Associate Professor in Botany, University of Massachusetts (Amherst); formerly Botanist in charge of scientific surveys, Cinchona Mission, United States Office of Economic Warfare, Lima, Peru.

study, it is his opinion that the number of species listed by Standley for Peru, and probably elsewhere, may be increased, for among the innumerable forms, varieties, and hybrids represented in the enormous literature of the genus, there are certain well-defined concepts which appear to be more or less stable and are easily recognizable especially in the field. Even among such a notoriously variable assemblage as is contained in the complex of *Cinchona pubescens* Vahl *sensu lat.*, there are entities which appear to be very stable. As an example, one might select the tree known as *C. succirubra* Pavon ex Klotzsch which was originally collected by Richard Spruce in Ecuador. This tree wherever grown, in the Far East, in Guatemala, and elsewhere, although often under ecological conditions quite different from its home-land, remains apparently true to type, not only in its general morphological characteristics, but also in such physiological features as the patterns of alkaloidal yield.

This is understandable, for the Andean terrain, like any lofty highly-dissected mountain mass, offers an extraordinary range of very localized and disjunct habitats which have permitted active speciation to occur. Certainly if adjacent Andean *hoyas*, isolated as they often are from their neighbors, can be marked by considerable local endemism among some groups of plants, why then cannot they be so considered as to their cinchonas as well?

The writer feels that certain entities at present considered as synonyms in the genus *Cinchona* were reduced to synonymy often without sufficient study and clearly must be resurrected if any semblance of order is to come out of this chaotic group. Rusby (in Bull. Torrey Bot. Club 58 (1931) 523–530) already has protested Standley's recent treatment of the genus for Bolivia (in Field Mus. Bot. 4 (1931) 266–273), and the present writer agrees

with him in part, at least regarding the status of certain species such as *Cinchona Calisaya* Weddell which he has met with in his travels in southern Peru. Indeed, the writer cannot but feel that a great deal of careful taxonomic work was accomplished by cinchona botanists of the past centuries and especially by such men as Ruiz & Pavon and Weddell who had become well acquainted with the species in the field.

In the pages that follow, the writer initiates a critical discussion of some poorly known Peruvian cinchonas in the light of his observations in the field. The species treated in this paper are easily recognizable because of the rather dense covering of hairs found on the leaves and young growth. Our knowledge of these species, up to now, has been based for the most part on the most meagre and fragmentary of herbarium material; in fact, certain of them are known only from types collected more than a century ago. Inasmuch as the existing descriptions of these plants are either incomplete or based only on the original collection, the writer includes modified descriptions based on a study of recent collections.

Besides his own collection (WHH), the first set of which is deposited in the herbarium of the United States National Arboretum (USNA), the writer has examined specimens of cinchonas in the following institutions, to whose curators he is indebted for kindnesses received during the study: Chicago Museum (F), Gray Herbarium (G), University of Massachusetts (M), New York Botanical Garden (NY), Museo Historia Natural "Javier Prado" of Lima (L), the United States National Herbarium (US), and the herbarium of the Estación Agrícola de Tingo María in Perú (TM).

Cinchona carabayensis *Weddell*

The identity of this cinchona has remained uncertain,

since it was incompletely described by Weddell (in Ann. Sci. Nat. III. 10 (1848) 9) from fruiting material collected by him in the Province of Carabaya (Dept. of Puno). While collecting in the same area during 1943, I discovered *Cinchona carabayensis*, but unfortunately my specimens of this species were among a number lost in transit in Peru. I still have very sketchy field notes and these may be of some value in relocating the species.

In the "Flora of Peru" Standley states that *C. carabayensis* was described "from thickets on the summits of the mountains between the valleys of the Province of Carabaya, especially near San Juan del Oro." Presumably these data came from the type label, for Weddell, in his original descriptions, merely gives the locality as "Peruvia." San Juan del Oro, now long abandoned and consequently not found on modern maps, was the most famous of the Spanish placer mining centers in this auriferous zone of southern Peru and was located on the ridges separating the watersheds of the Upper Inambari (here called the Huari-Huari) and Upper Tambopata Rivers. The much overgrown site of the mine may be reached by trail in about two days from the town of Sandia. Since Weddell's time the Province of Carabaya has been divided, with the result that old San Juan del Oro, as well as most other important cinchona areas (such as the Tambopata Valley, "Valle Grande" of the Huari-Huari, etc.) in the Department of Puno, are now included in the modern Province of Sandia. On the other hand, the modern Province of Carabaya, with Macusani as the capital, occupies only that part of the old Province of Carabaya lying west of a line drawn north and south through Limbani, a line which roughly parallels the Limbani-Mina Sto. Domingo-Astillero mule trail.

It was in this same general area in early 1943 that *C.*

carabayensis was rediscovered. About a half day northeast of Sandia the present trail into the eastern forested country (called *montaña* in Peru) forks into three trails, one of which continues down the valley of the Sandia River into the old San Juan del Oro area, another cuts off over a ridge to the east to enter the Tambopata Valley, and the third runs northwesterly over a very steep ridge into the Valle Grande section of the Huari-Huari Valley via the small Cachi-Cachi placer mine. The last-named trail passes in its preliminary ascent over a very steep ridge known as Ramospata which is covered with thickets and small trees characteristic of the Andean tree-line or *ceja de la montaña*, In this thicket community *C. carabayensis*, locally called *echenique*, is common and is particularly abundant between the *tambos* (trail shelters) known as Ichubamba and Ramospata.

Specimens of this cinchona are shrubs or occasionally small trees seldom attaining a height of over three meters. In its general habit the species resembles *C. Josephiana* Weddell (also called *echenique*) which is found at lower elevations on the same slopes of the Sandia Valley. From glabrous *C. Josephiana*, *C. carabayensis* may be separated easily by the presence of tomentum which covers all young growth, twigs, inflorescence branches, lower surfaces of the leaves, etc. From my field notes is appended here a general, if still inadequate, description of this tree transcribed in the field from fresh specimens in the hand:—"leaves averaging 15 cm. long by 5.5 cm. broad, similar in shape to those of *C. Calisaya* Weddell but dull in aspect rather than lustrous and smooth; petioles similar to those of calisaya; basal portion of the midrib with a suggestion of red on the upper surface; venation more complex than that of calisaya; young leaves with scattered pubescence on upper surfaces, all leaves with tomentum beneath, the same type

of tomentum covering all parts of young growth including inflorescences; flowers distinctly pink especially in bud, fainter when open, the calyx a deeper pink changing into deep red as the young green capsule develops."

In its densely tomentose habit *C. carabayensis* differs from all other cinchonas known to me from southern Peru. The closest relative of this rare tree of the Andes of Carabaya appears to be the similarly hairy *C. Pahudiana* Howard (discussed below), a better-known tree of the Chanchamayo Region of central Peru. These two species have been considered conspecific by Standley, but the writer's impression from field observation is that they are distinct. However, the fragmentary herbarium material of *C. carabayensis* and Weddell's rather incomplete description make it impossible to compare critically these two trees. Howard noted a similarity between the two species, but pointed out correctly that one was normally a shrub, the other always a tree; he also noted differences in the leaves. Until more abundant material of *C. carabayensis* is in hand, it seems best to consider it apart, especially since the two species are rather widely disjunct. It should be pointed out that *C. Pahudiana*, not *C. carabayensis*, was the species introduced into cultivation in Java and elsewhere in the past century.

In addition to the living plants, the writer has also examined material, possibly the type (ex herb. Paris), in the herbarium of the Chicago Museum (sheet no. 971330) and collected by Weddell in the "Province of Carabaya." Besides the differences noted above, the capsules of Weddell's specimen are much coarser and more woody than those of *C. Pahudiana*. Seed differences may also exist, for the ones examined are large in comparison with those of most Peruvian cinchonas. It is hoped that botanists who may get into this interesting area of southern Peru will keep their eyes open for this neglected species.

Cinchona glandulifera *Ruiz & Pavon*

As far as I can learn, this little-known species has not been collected until recently, since it was originally discovered and described by Ruiz and Pavon in central Peru. Standley discusses *Cinchona glandulifera* in his treatment of the genus in the Flora of Peru and states that, besides the herbarium specimen at Berlin (probably the type) which was destroyed during the war, material (an isotype?) is also to be found in the Delessert Herbarium. Fortunately a photograph (Field Museum neg. no. 102) was made of the Berlin specimen and this agrees very well with plates of this species published in the works of Ruiz and Pavon and of Howard.

Recently my good friend, Ing. Hernán Augusto (a Peruvian agronomist and Superintendent of Fundo Sinchono, and formerly associated with the U. S. Government Cinchona Mission in Peru), made available excellent specimens and data of an unidentified cinchona collected by him in the upper Monzón River valley near Tíngo María in 1944. His material proved to represent *Cinchona glandulifera*, from the type locality, and was an excellent match for the specimen of Ruiz and Pavon. The type material of Ruiz and Pavon originated in the mountains near Chicoplaya ("in *Peruviae Andium montibus nemorosis ad Chicoplaya runcationes, Carpales dictas*"). The species is also reported by them from Monzón, Panatahuas, and Cochero (also written Cocheros or Cuchero).

The type locality of Chicoplaya is not shown on most modern maps[1]; it is a hacienda in the Monzón valley

[1] Chicoplaya, type locality of *Cinchona glandulifera*, and nearby San Antonio de Playa Grande, type locality of *C. micrantha* R. & P. apparently were not visited by Ruiz and Pavon but by their collectors, including Juan Tafalla, for the localities are not indicated on the map of the itinerary of Ruiz and companions recently published (Field

about midway between Monzón and Tíngo María. It is the lowland terminus of a mule trail running down the valley from the highland community of Tantamayo.

I have also collected this species in northern Peru near the hamlet of Pomacochas in the Department of Amazonas, and specimens referable to *C. glandulifera* were collected in the same department by Antonio Raimondi, and in the Department of San Martín by Richard Spruce. The specimens from Amazonas differ somewhat from typical and topotypical material in length of petiole and in leaf shape, but otherwise are quite like the tree as it occurs in central Peru. Inasmuch as *C. glandulifera* has been found as far north in Peru as northern Amazonas, it very likely occurs in the intervening territory, particularly on the western slopes of those Andean ranges lying west of the Huallaga River. This particular inaccessible sector is actually one of the least known botanically in Peru, at least as far as the genus *Cinchona* is concerned.

Unlike most other Peruvian species, *C. glandulifera* is a shrub, in its type locality averaging three meters high (Augusto!), and in the Pomocochas area seldom attaining a height of over two meters. It is a sun-loving species always occurring among other low-growing shrubs and grasses in open communities known among the Peruvians as *pajonales*. In Pomocochas this cinchona is dominant in the community in which it occurs. Such

---

Mus. Bot. 21 (1940) 9). Ruiz and Pavon apparently got no farther than Cuchero at the confluence of the Chinchao and Huallaga rivers. The localities in question are both located in the Monzón River Valley which joins the Huallaga at the site of present day Tíngo María. Both Chicoplaya and San Antonio de Playa Grande may be found on the map ("Plan del curso de los rios Huallaga y Ucayali y de la Pampa del Sacramento") made by Manuel Sobreviela—one of several maps in the atlas accompanying Herndon and Gibbon's published account of the exploration of the valley of the Amazon (Executive, No. 53, 33d Congress, House of Representatives, Washington, 1854).

sites usually are to be found on open ridges generally close to timber-line where tree types are replaced by shrubby growth and herbaceous or suffruticose perennials. Where *pajonales* merge into woodlands, types of *C. pubescens* are found, and this species is of all the cinchonas the closest associate of *C. glandulifera.* In its choice of sites and in its shrubby growth-form, hairy *C. glandulifera* is identical with *C. Josephiana* Weddell of southern Peru. However, the latter plant is easily distinguished from the former by well-marked morphological differences, the most obvious being its glabrosity.

In central Peru this diminutive species with its narrowly elongate panicles is in flower from at least February to July. Diagnostic features of *C. glandulifera*, other than its shrub form and hairiness, are the very short capsules and very small seeds.

An analysis of a composite sample of bark from several individuals of this species from Pomocochas has yielded only traces of crystallizable alkaloids, principally cinchonine. Even if the shrub were of value as a source of alkaloids, the small size of the stems would prohibit profitable commercial exploitation.

There follows an expanded description of the species based on recent collections.

Cinchona glandulifera *Ruiz & Pavon* Fl. Peruv. et Chil. 3 (1802) 1, pl. 224.

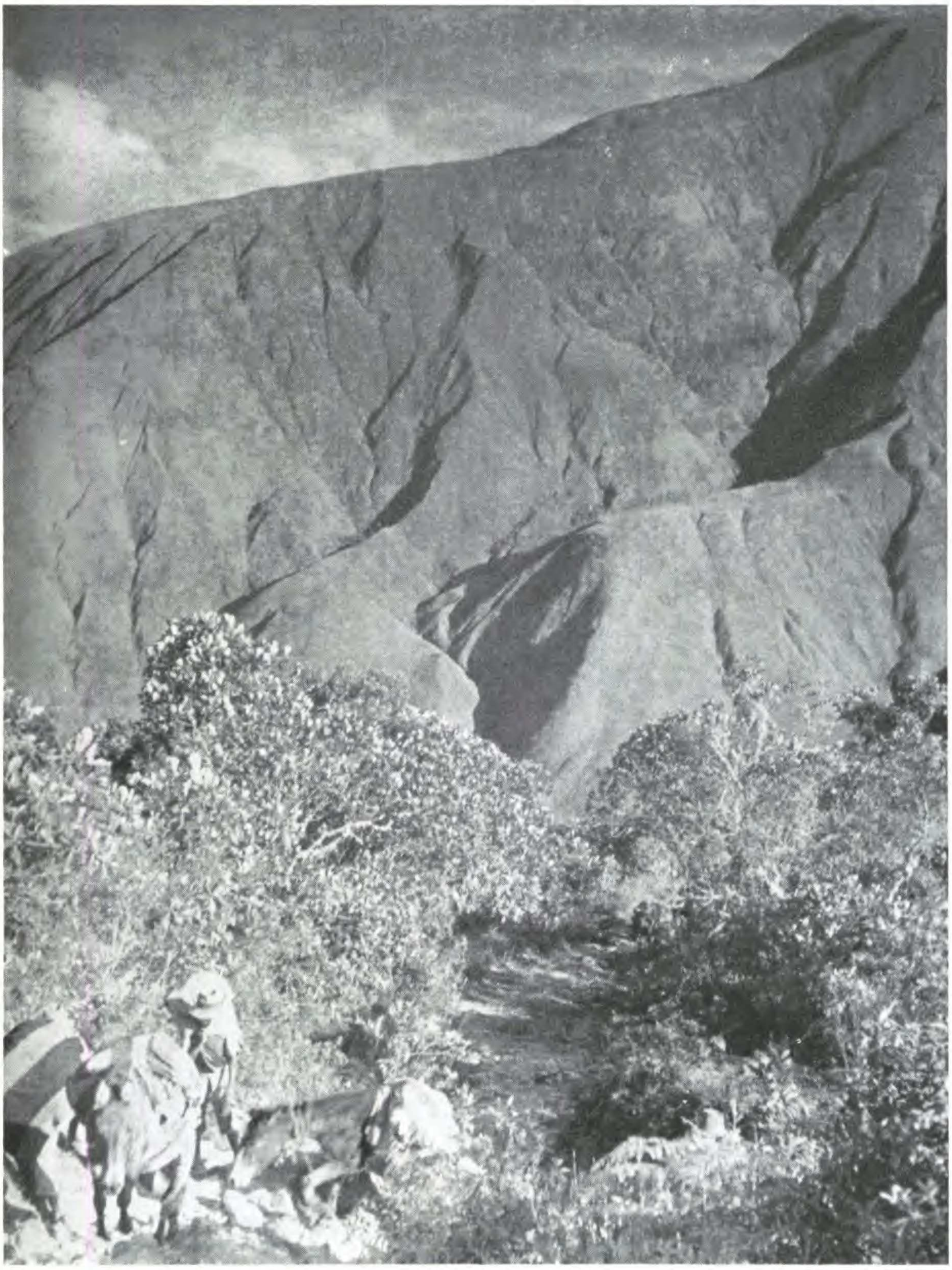
A shrub or occasionally a small tree 2–5 m. high with several trunks, these as much as 7 cm. thick; bark ashy to dark gray, the outer surface marked with inconspicuous fine transverse fissures, the youngest branchlets pilose or hirsute; stipules 12–40 mm. long, elliptical to oblong, obtuse to acute, somewhat villose; leaves subsessile, or with short petioles 2–15 mm. long, the blades ovate to lanceolate or oblong-elliptic, 6–16 cm. long, 2.5–8.5 cm.

EXPLANATION OF THE ILLUSTRATION

PLATE XXXVII. Mule trail up the Ramospata ridge out of the Sandia Valley (Dept. of Puno) Peru. In the thickets in the foreground *Cinchona carabayensis* Weddell was rediscovered.

Photograph by W. H. HODGE

Plate XXXVII



EXPLANATION OF THE ILLUSTRATION

PLATE XXXVIII. CINCHONA GLANDULIFERA *Ruiz & Pavon* growing near Pomocochas (Dept. of Amazonas) Peru. Clump from which *Hodge 611-3* was collected.

Photograph by W. H. HODGE

Plate XXXVIII

EXPLANATION OF THE ILLUSTRATION

PLATE XXXIX. CINCHONA PAHUDIANA *Howard*. A representative specimen (*Hodge 624*3) from the region of the Chanchamayo Valley in central Peru.

Photograph by W. H. HODGE

Plate XXXIX

EXPLANATION OF THE ILLUSTRATION

PLATE XL. CINCHONA PARABOLICA *Pavon* in thickets near Tabaconas (Dept. of Cajamarca) Peru.

Photograph by W. H. HODGE

Plate XL

broad, the tips acute to obtuse, bases acute to obtuse or occasionally subcordate, glabrous and sometimes somewhat lustrous above, hirsute beneath, especially on the nerves, midribs usually reddish when fresh, vein-pairs 7–12; panicles generally narrowly elongate but small and compact, leafy, hairy, terminal and axillary, many-flowered, the flowers short-pedicellate, often in nodding clusters; hypanthium about 1.5 mm. long, densely yellowish-pilosulose; calyx darker, 1.5–2 mm. long with short triangular teeth, pilosulose outside, glabrous within; corolla pink, 7–12 mm. long, tomentose outside; capsule short, 7–15 mm. long, elliptical to oblong, pubescent to glabrate; seeds small, about 4 mm. long.

COLLECTIONS EXAMINED:

PERU: Huánuco: Described from the mountains of Chicoplaya, Province of Huámalies, *Ruiz & Pavon;* photograph of authentic material (presumably the type) ex herb. Berlin (Field Museum negative no. 102). Alturas de Carash (Province of Huámalies), Monzón Valley, on trail between Monzón and Tantamayo, 1735 m., *Augusto* 8, 8A (TM, WHH).—Amazonas: Summit of trail running between Pomocochas and Yambrasbamba (Province of Bóngara), 7200 feet, *Hodge 6113* (L, M, USNA, WHH). Summit of ridge separating Pomocochas from Shipasbamba (Province of Bóngara), 8500 feet, *Hodge 6109* (L, M, USNA, WHH). Valle de Huayabamba (Province of Chachapoyas), 2500 m., *Raimondi 974* (L, WHH fragment).—San Martín: In monte Campana (Province of Lamas) prope Tarapoto (now San Martín) Peruviae orientalis, *R. Spruce 4832*, Aug. 1856 (G, NY), cited doubtfully as *C. officinalis* by Standley in the Flora of Peru.—Common names: *cascarilla negrilla*, *cascarilla delgada*, *cascarilla del pajonal* (Huánuco), *cascarilla negra* (Amazonas).

CINCHONA PAHUDIANA *Howard*

Although the status of *C. carabayensis* is uncertain because of the lack of ample herbarium material, the identity of *C. Pahudiana* is sure. This rather easily identified species was originally collected by Justus Charles Hasskarl near Uchubamba which is a hamlet in the valley of the Tulumayo River (near the Chanchamayo Val-